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Milwaukee County Courthouse – Façade Evaluation

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Belfor Property Restoration

June 8, 2010

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PROJECT: Milwaukee County Courthouse
Façade Evaluation
Milwaukee, Wisconsin

DATE: June 8, 2010
FILE NO: 301164

REPORTED TO:
Belfor Property Restoration
2929 North 114th Street
Wauwatosa, WI 53222

Attn: Mr. Mark Siegwald

FACADE EVALUATION

GENERAL

The Milwaukee County Courthouse is located at 901 North 9th Street, Milwaukee, Wisconsin. Construction of the building was completed in 1931 and it is listed in the National Register of Historic Places. The footprint of the building is approximately 439' x 196' and it is about 188' tall at the top of the penthouse roof. The framing consists of concrete encased steel beams and masonry encased steel columns with limestone cladding.

On the morning of March 4, 2010, a spall of limestone, approximately 10" in diameter, was found on the ground, adjacent to the west side of the building (Photos #1 - #3). The area was cordoned off as a safety precaution.

Building Elevations

West Elevation

South Elevation

East Elevation

North Elevation

OBSERVATIONS

West Elevation

Overhead canopy protection was installed on the west side of the building on March 5, 2010. With the assistance of Holton Brothers, Inc., hands-on examination of the west side of the building in the area of the fallen spall was performed via a 135' man lift on March 5, 2010. Upon investigation, open mortar joints were observed in the limestone cornice directly above the spalled area (Photos #4 - #7). The copper cornice cap, integral with the copper gutter, had open seams and gaps at fastener locations (Photos #8 – #9). Exposed limestone underneath the copper cornice cap was cracked and had begun to spall (Photos #10 - #12). A portion of joint sealant directly above the spalled area was removed and the backer rod was wet (Photos #13 - #14). Evidence of previous repairs adjacent to the spalled area were noted (Photos #15 - #16). For safety, loose limestone was removed from the spalled area and also from adjacent areas (Photos #17 - #19).

On March 9, 2010, and March 10, 2010, hands-on examination of the entire west elevation was performed via a 135' man lift. Examination from the roof level was also conducted on March 10, 2010. Debris was observed in the copper gutter, above the cornice, which clogged the roof drains (Photos #20 - #23). Cracks, spalls, open mortar joints, and previous repairs were observed (Photos #24 - #29). Areas of loose limestone were removed.

South, East, and North Elevations

On March 15, 2010, visual examinations were performed from the ground level of the south, east, and north elevations. Further examination was performed from the roof level (Photos #30 - #32).

Between March 29, 2010, and April 28, 2010, with the assistance of Holton Brothers, Inc., hands-on examinations were performed on the west penthouse walls, adjacent to the street and on the south, east, and north facades of the building via swing stage. Areas of loose limestone were removed during each swing stage drop. The following items were noted during the subsequent examinations.

1. Open and debonded limestone mortar joints (Photos #33 - #36).

2. Application of sealant at limestone joints most notably at the cornice (Photos #37 - #38).

3. Copper gutter and cornice cap with open solder joints, open holes at fasteners and previous patches (Photos #39 - #41).

4. Debris in copper gutter (Photo #42).

5. Cracks in limestone (Photos #43 - #44).

6. Low severity spalls and degraded limestone (Photos #45 - #48).

7. High severity spalls in limestone (Photos #49 - #55).

8. Previous repairs of cracks in limestone (Photos #56 - #57).

9. Previous Dutchman repairs of limestone (Photos #58 - #59).

10. Previous repairs of spalls in limestone (Photos #60 - #61).

11. Failed joint sealant, most notably on horizontal surface of ledges (Photos #62 - #63).

12. Failed sealant around perimeter of windows (Photos #64 - #65).

13. Failed sealant around perimeter of drain wells at base of columns (Photos #66 - #67).

14. Rust staining on face of limestone (Photos #68 - #70).

15. Cracks in brick walls, as observed from the roof (Photo #71).

Southeast Corner and Partial East Elevation

On April 30, 2010, a 197' crane with a basket provided access to the cornice level of the southeast corner and adjacent east side of the building. Portions of loose limestone at the corner which were noted during a previous swing stage drop, but were unable to be reached at that time, were removed (Photos #72 - #73).

Further investigation of the copper gutter and cornice cap was also performed by Langer Roofing and Sheet Metal, Inc., via the crane and basket. In a 100' section of the copper gutter, they noted 5 of 11 riveted and soldered seams were cracked. No expansion joints were installed in the gutter. A 20' section of counterflashing was removed. The gutters were mechanically fastened through the top of the gutter into the limestone behind. Only 2 of 9 fasteners remained intact. The copper counterflashing for the gutter was attached to the copper receiver with stainless steel screws. The receiver was set in the limestone and the joint was caulked. At numerous locations, the caulk had pulled away from the limestone. The gutters were installed over what appeared to be an asbestos base fabric. The copper cornice was fabricated from lead coated copper and was hooked and soldered to the front edge of the gutter. The outside edge of the cornice cap was fastened through the lead coated copper into the limestone cornice. At most locations, the fasteners were deteriorated. No expansion joints were incorporated into the cornice cap. In numerous locations, the soldered joints of the cornice are cracked. A corner section of the cornice cap was noticed to be detached upon our arrival at the site (Photo #74). Langer Roofing and Sheet Metal, Inc. re-attached this corner with stainless steel fasteners. Some of the copper counterflashings had been deformed, as a result of ice damming.

COMMENTS

The defects found on the façade were generally similar around the entire building. The quantity and severity of the deficiencies did vary from elevation to elevation. The east elevation and the northeast and southeast corners of the building appeared worst.

Typical defects with a brief description and their approximate quantities are identified for each elevation of the building as follows.

Defect ID **Description**

1 Open and debonded mortar joints

Quantities	
West Elevation	100% at cornice, 50% elsewhere
South Elevation	100% at cornice, 10% elsewhere
East Elevation	100% at cornice, 10% elsewhere
North Elevation	100% at cornice, 10% elsewhere

Defect ID **Description**

2 Application of sealant at masonry joints

Quantities	
West Elevation	100% at cornice, random locations above gutter line
South Elevation	100% at cornice, random locations above gutter line
East Elevation	100% at cornice, random locations above gutter line
North Elevation	100% at cornice, random locations above gutter line

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Defect ID **Description**

3 Open joints, holes, and previous patches in copper gutter and cornice cap

Quantities	
West Elevation	460 ln. ft. (entire length)
South Elevation	215 ln. ft. (entire length)
East Elevation	460 ln. ft. (entire length)
North Elevation	215 ln. ft. (entire length)
Total	**1,350 ln. ft.**

Defect ID	Description
4	Debris in copper gutter

Quantities	
West Elevation	X
South Elevation	
East Elevation	X
North Elevation	

Defect ID	Description
5	Cracks in limestone

Quantities	
West Elevation	15 ln. ft.
South Elevation	15 ln. ft.
East Elevation	35 ln. ft.
North Elevation	30 ln. ft.
Total	**95 ln. ft.**

Defect ID	Description
6	Low severity spalls in limestone

Quantities	
West Elevation	45 sq. ft.
South Elevation	50 sq. ft.
East Elevation	250 sq. ft.
North Elevation	15 sq. ft.
Total	**360 sq. ft.**

Defect ID	Description
7	High severity spalls in limestone

Quantities	
West Elevation	1 sq. ft.
South Elevation	1 sq. ft.
East Elevation	2 sq. ft.
North Elevation	14 sq. ft.
Total	**18 sq. ft.**

Defect ID **Description**

8 Previous crack repairs in limestone

Quantities	
West Elevation	70 ln. ft.
South Elevation	35 ln. ft.
East Elevation	85 ln. ft.
North Elevation	70 ln. ft.
Total	**260 ln. ft.**

Defect ID **Description**

9 Previous Dutchman repairs in limestone

Quantities	
West Elevation	2 sq. ft.
South Elevation	2 sq. ft.
East Elevation	2 sq. ft.
North Elevation	14 sq. ft.
Total	**20 sq. ft.**

Defect ID	Description
10	Previous spall repairs in limestone

Quantities	
West Elevation	15 sq. ft.
South Elevation	15 sq. ft.
East Elevation	40 sq. ft.
North Elevation	5 sq. ft.
Total	**75 sq. ft.**

Defect ID	Description
11	Failed joint sealant in limestone

Quantities	
West Elevation	100% at ledges
South Elevation	100% at ledges
East Elevation	100% at ledges
North Elevation	100% at ledges

Defect ID	Description
12	Failed perimeter window sealant

Quantities	
West Elevation	100%
South Elevation	100%
East Elevation	100%
North Elevation	100%

Defect ID	Description
13	Failed perimeter sealant around drain wells

Quantities	
West Elevation	100%
South Elevation	100%
East Elevation	100%
North Elevation	100%

Defect ID	Description
14	Rust staining on limestone

Quantities	
West Elevation	
South Elevation	10 sq. ft.
East Elevation	400 sq. ft.
North Elevation	
Total	**410 sq. ft.**

Defect ID	Description
17	Cracks in brick wall above roof

Quantities	
Above roof	100 bricks

CONCLUSIONS

Based on our observations it is our opinion that damage sustained to the copper gutter system and associated flashings as a result of ice damming as well as open joints in the limestone masonry allowed water to infiltrate into the wall. Freeze-thaw of the trapped moisture in the stone fractured the limestone resulting in spalls. These conditions occur throughout the façade of the building. Loose and ready to fall spalls observed were removed during the course of the evaluation, however, additional spalls may propagate until such time as proper repairs of the gutter system and masonry are completed.

REMARKS

This report was prepared by Inspec with the understanding that due to the physical properties of the many materials commonly used for constructing facades and the limitations on detecting concealed internal wall distresses, "Unsafe and imminently hazardous conditions" in the façade that are not visible from the exterior, may exist. Therefore, submittal of this report is not a representation that all "unsafe and imminently hazardous conditions" in the façade have been identified or removed. This report is not intended to be used by others as reparation documents.

INSPEC

By: Michael F. Wiscons

Michael F. Wiscons, P.E.
Structural Engineer

Photo #1 – Location of limestone spall

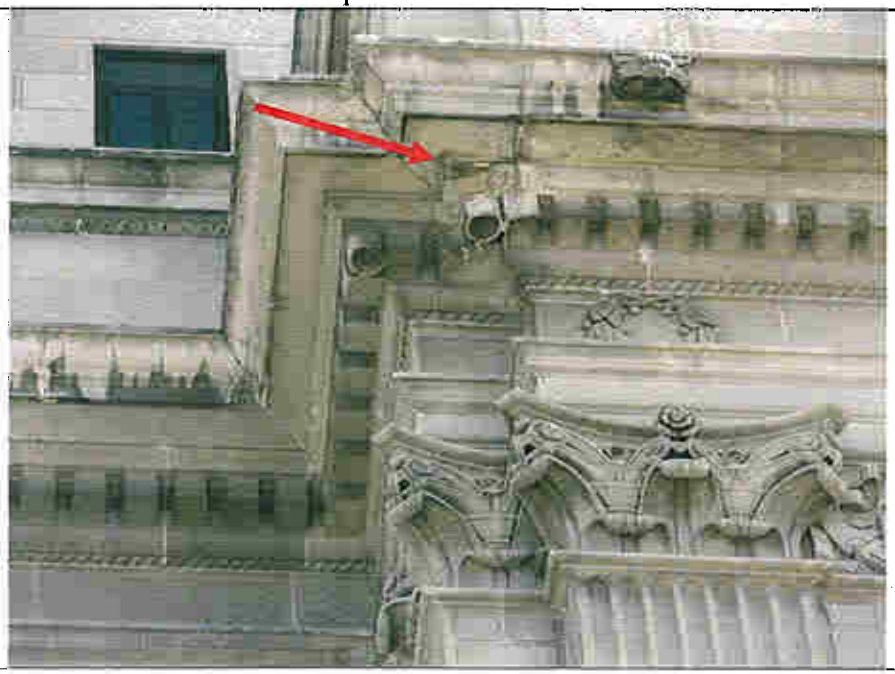

Photo #2 – Location of limestone spall

Photo #3 – Remains of limestone spall

Photo #4 – Open mortar joints in limestone cornice

Photo #5 – Open mortar joints in limestone cornice

Photo #6 – Open mortar joints in limestone cornice

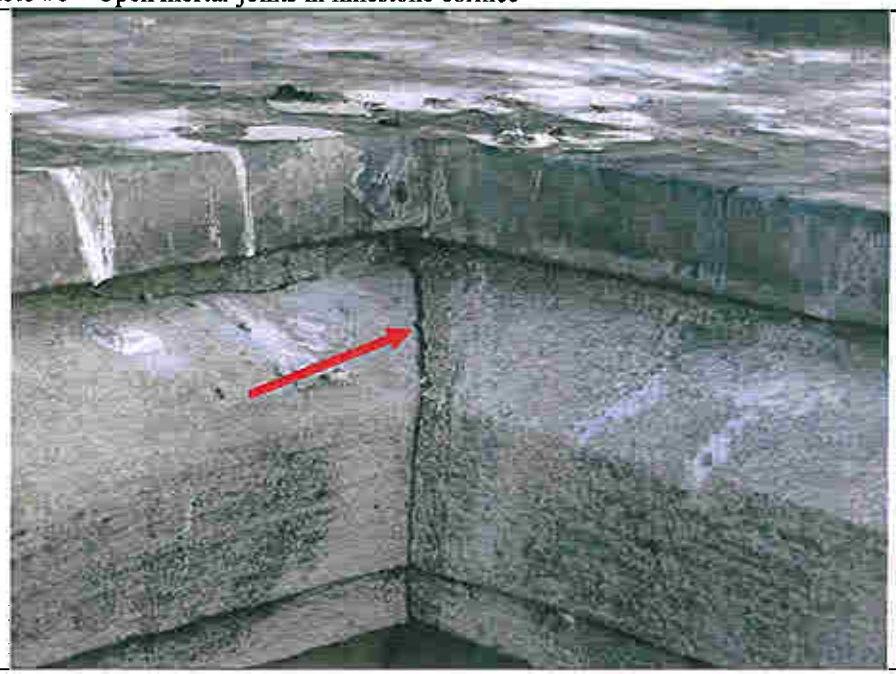

Photo #7 – Open mortar joints in limestone cornice

Photo #8 – Open seam and gap at fasteners of copper cornice cap

Photo #9 – Open seam and gap at fasteners of copper cornice cap

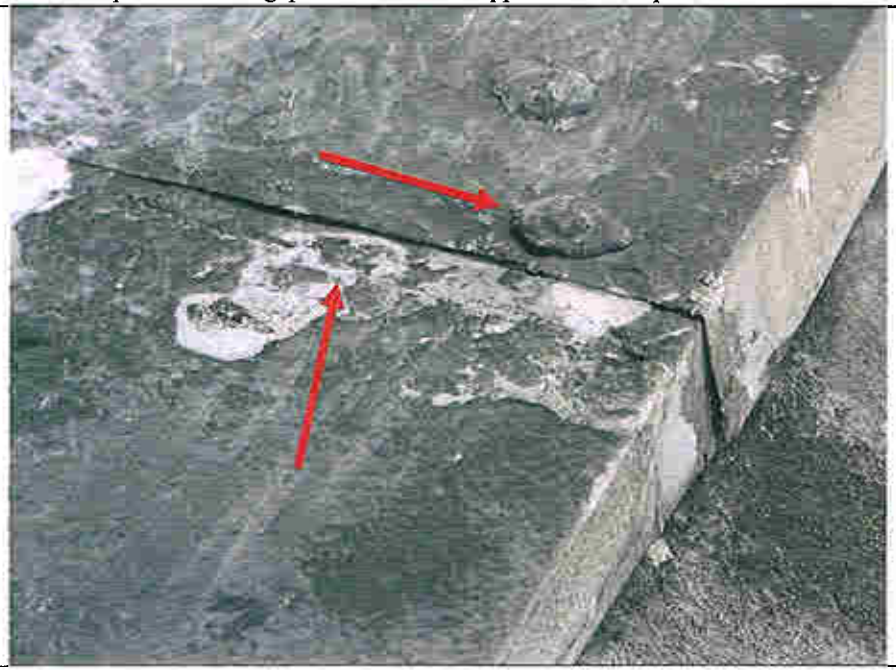

Photo #10 – Limestone spall beneath copper cornice cap

Photo #11 – Limestone spall beneath copper cornice cap

Photo #12 – Limestone spall beneath copper cornice cap

Photo #13 – Joint sealant and wet backer rod above spall

Photo #14 – Joint sealant and wet backer rod above spall

Photo #15 – Previous repairs adjacent to spall

Photo #16 – Previous repairs adjacent to spall

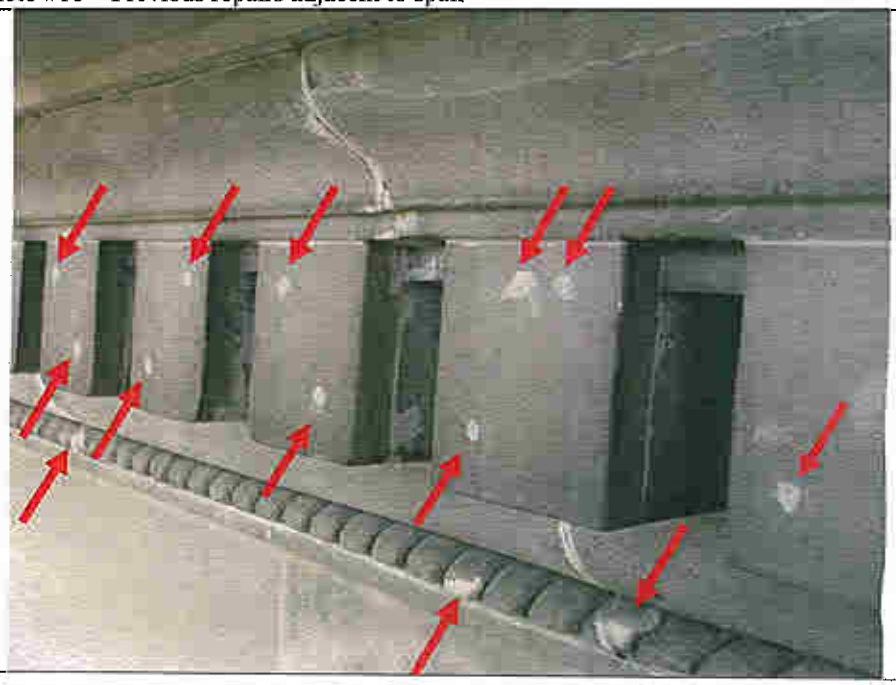

Photo #17 – Removal of loose masonry at spall

Photo #18 – Removal of loose masonry adjacent to spall

Photo #19 – Removal of loose masonry adjacent to spall

Photo #20 – Debris in west gutter

Photo #21 – Debris in west gutter

Photo #22 – Standing water in west gutter

Photo #23 – Bird's nest in west gutter

Photo #24 – Crack in limestone

Photo #25 – Spall beneath cornice cap

Photo #26 – Spall beneath cornice cap

Photo #27 – Spalls in limestone dentils

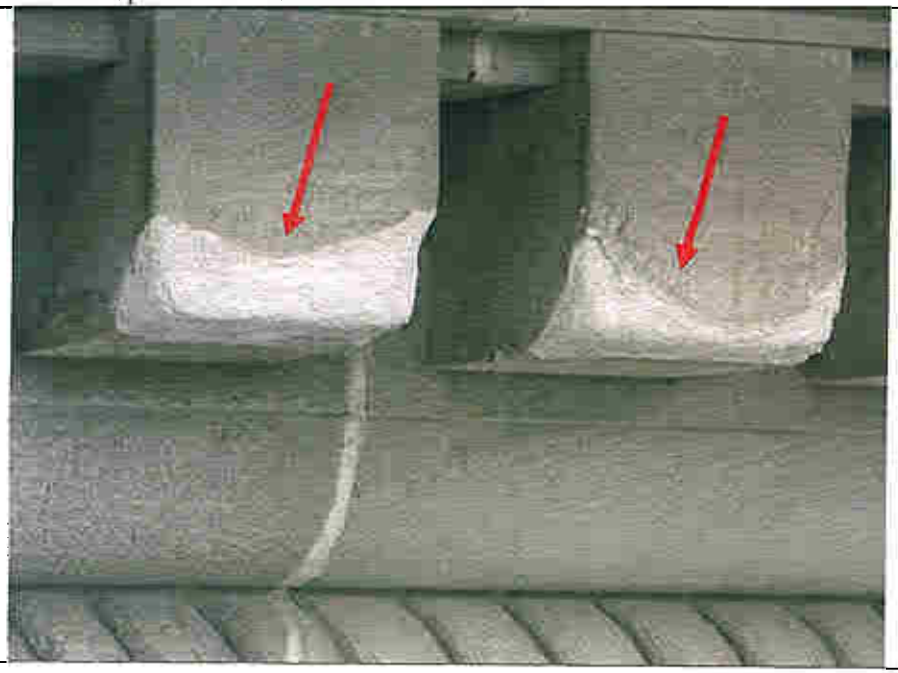

Photo #28 – Open mortar joint in cornice

Photo #29 – Previous repair of crack

Photo #30 – Roof looking northwest

Photo #31 – Back of parapet

Photo #32 – Scupper and downspout

Photo #33 – Open mortar joint

Photo #34 – Open mortar joint

Photo #35 – Debonded mortar joint in cornice

Photo #36 – Debonded mortar joint in cornice

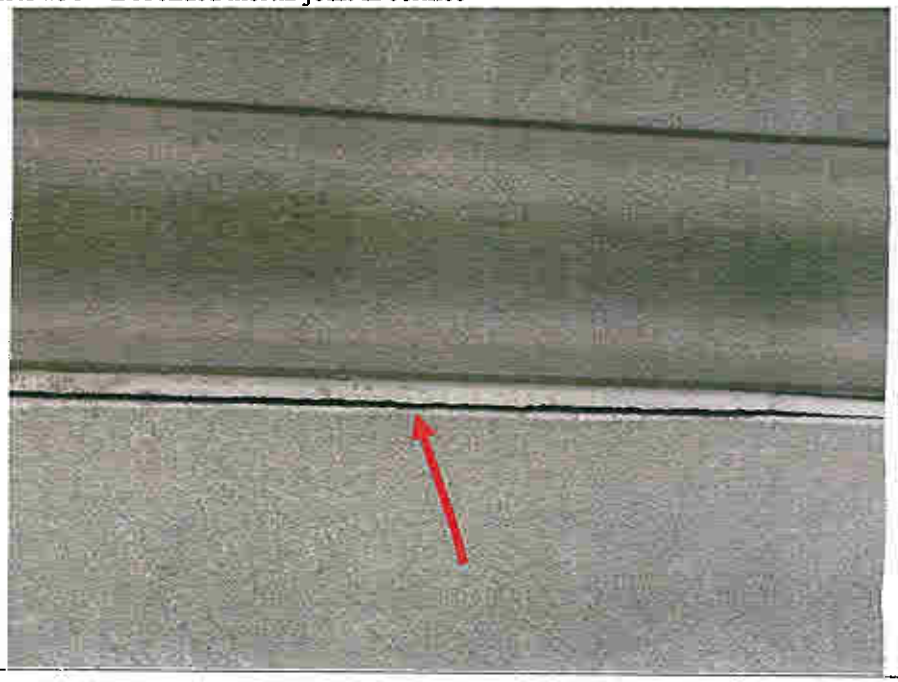

Photo #37 – Application of joint sealant at cornice

Photo #38 – Failed sealant at limestone joint above gutter

Photo #39 – Open joint in copper cornice cap

Photo #40 – Tear and opening in copper cornice cap

Photo #41 – Previous patch of gutter at southeast corner

Photo #42 – Bird's nest in gutter of southeast corner

Photo #43 – Cracks in limestone

Photo #44 – Cracks in limestone

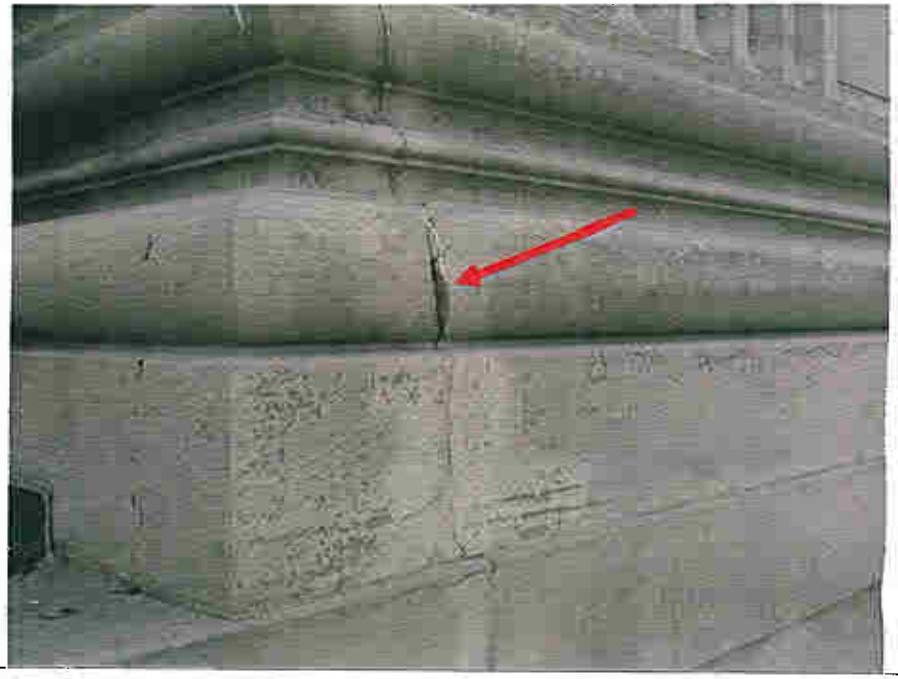

Photo #45 – Low severity spalls in limestone

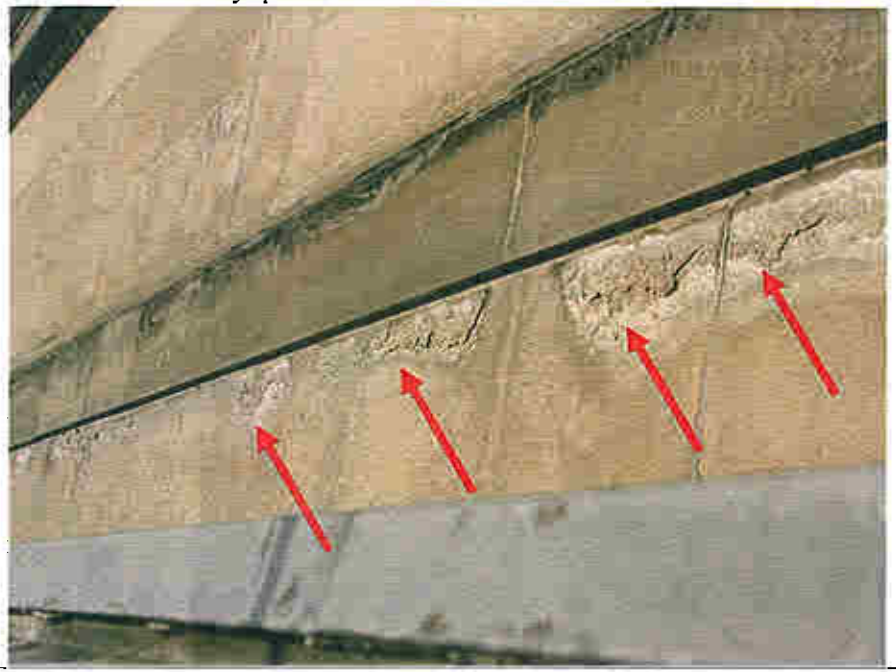

Photo #46 – Low severity spall in limestone

Photo #47 – Degraded limestone on underside of cornice

Photo #48 – Removed degraded limestone on underside of cornice

Photo #49 – High severity spall in limestone on north wall

Photo #50 – Removed high severity spall in limestone on north wall

Photo #51 – High severity spall in limestone at north end of east wall

Photo #52 – Removed high severity spall at north end of east wall

Photo #53 – Remains of high severity spall at north end of east wall

Photo #54 – Removed high severity spall at east end of north wall

Photo #55 – Remains of high severity spall at east end of north wall

Photo - #56 – Previous crack repair at base of column

Photo #57 – Previous crack repair

Photo #58 – Previous Dutchman repairs

Photo #59 – Previous Dutchman repairs

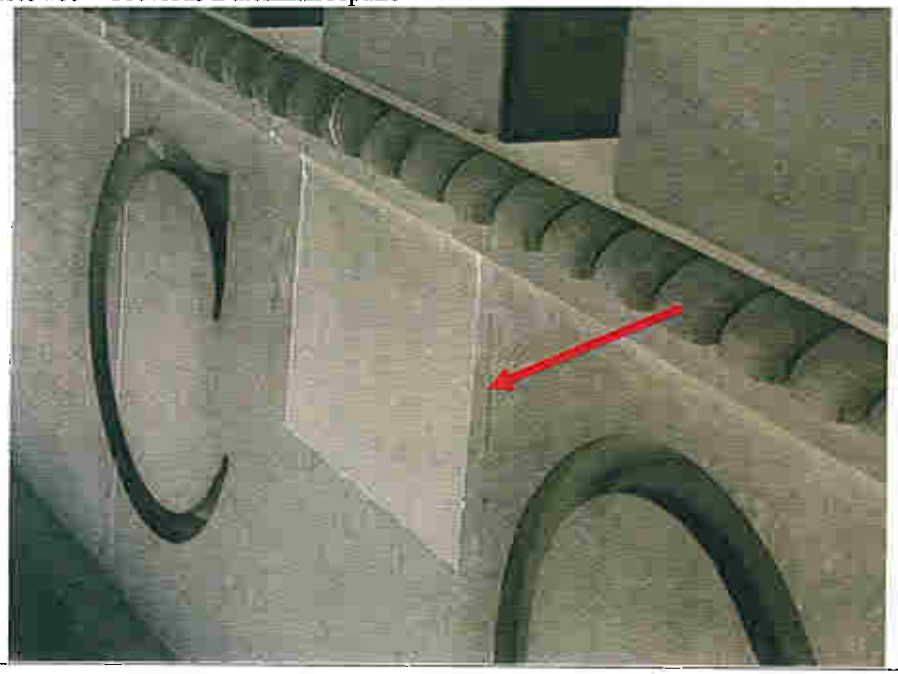

Photo #60 – Previous spall repair

Photo #61 – Previous spall repair

Photo #62 – Failed joint sealant on top of ledge

Photo #63 – Failed joint sealant on top of ledge

Photo #64 – Failed window sealant

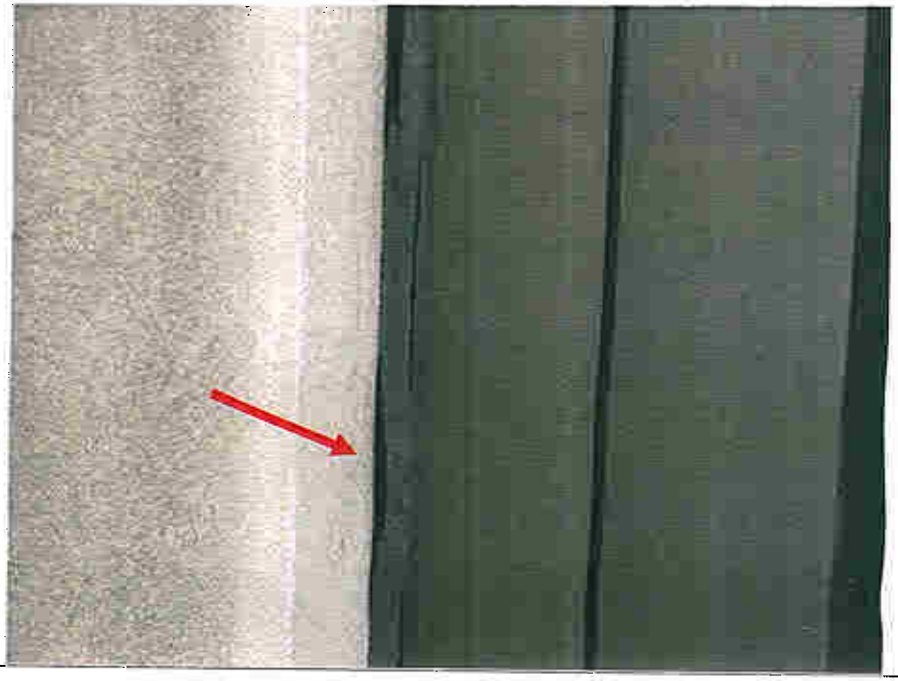

Photo #65 – Failed window sealant

Photo #66 – Failed sealant around perimeter of drain well

Photo #67 – Failed sealant around perimeter of drain well

Photo #68 – Rust stains at southeast corner

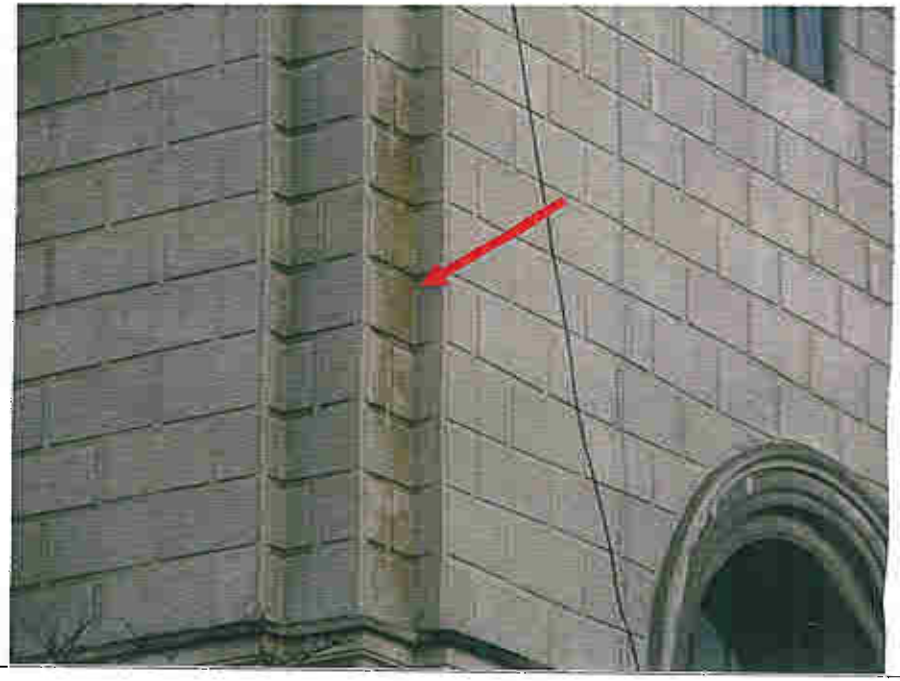

Photo #69 – Rust stains on face of limestone

Photo #70 – Removed deteriorated limestone at rust stain locations

Photo #71 – Cracks in brick wall above low roof

Photo #72 – Removed loose masonry at southeast cornice

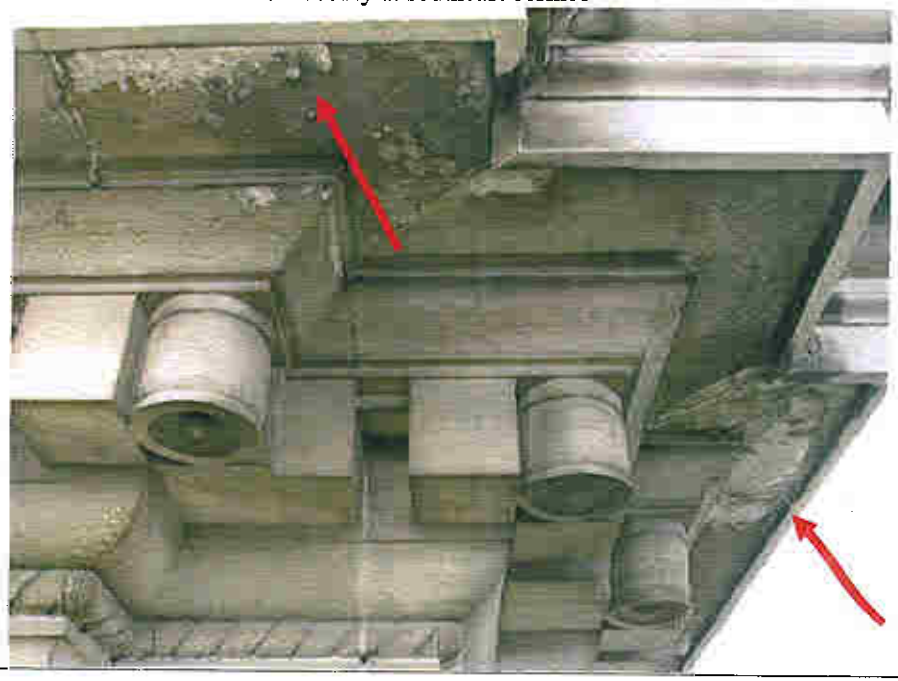

Photo #73 – Removed loose masonry at southeast cornice

Photo #74 – Detached cornice cap at southeast corner prior to re-attachment